View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by International Institute for Science, Technology and Education (IISTE): E-Journals

Journal of Environment and Earth Science www.iiste.org
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
Vol.5, No.10, 2015

Assessment of status of Wetlands in Ede, Osun State, Nigeria

[1]Audu, S.O., [2]Ejenma, E., [2]Emehute,V.C., [2]Okoroafor, I.B., [2]Oyediran, A.G., [2]Njoku, I.O. and [2]Nebo, A.I.
[1]Regional Centre for Training in AeroSpace Surveys, Ife Nigeria.
[2]Federal College of Agriculture, Ishiagu, Ebonyi State Nigeria.
Corresponding author: eyinnaya@gmail.com

Abstract
The status of wetlands in Ede, Osun State was studied using some geospatial techniques of GIS and remote sensing. Spatial and non-spatial data sets including the administrative up of the area were extracted from the local government area. Supervised classification was done to match spectral classes in the ENVI 4.7 environment. These were identified as built-up areas, bush land, farmland, bare land and wetland/swamps. Operations as filtering were carried out to improve the image quality in the ENVI 4.7 environment. The class masks are ENVI 4.7 classification images with class colours matching the final state image (2012). Results identified nine (9) wetland sites with various land use activities as settlements, infrastructure development and cultivation. The larger area of Ede and environs is used for settlement and agriculture, whereas the larger urban portion is used for infrastructure development as road construction, dams, and educational institutes. The use of satellite remote sensing sensors, computerised mapping techniques and GIS now enhances the ability to capture more detailed and timely information about natural resources at various scales.
Keywords: Wetlands, natural resources, Ede, remote sensing, GIS.

Introduction

About three percent of the territory of Nigeria’s land surface is covered by inland and coastal wetlands (Garnier, 1967) and it is one of the prominent land cover types. A wetland is an area of land which is saturated with moisture either permanently or seasonally. Such an area may also be covered partially or completely by shallow pools of water which include; swamps, bogs, fen and peat land among others. The water in wetlands may be brackish or fresh. Wetlands constitute an important ecology in Nigeria’s agriculture especially rice cultivation in south eastern Nigeria. They also serve as granaries for water storage, nurseries for fish, sustenance of biodiversity, basins for treatment of urban waste water, shore land, stabilization and protection, water purification, nutrient cycling, sediment retention and export, recreation and tourism, education, research, aesthetics and culture. In Nigeria, anthropogenic threats and bio-geophysical factors such as population pressure, urbanization, mining, pollution, crop production, overgrazing, logging and dam construction have greatly affected wetlands. Unsustainable use of wetlands and river basins could result in higher frequency and severity of flooding, drought and pollution, posing heavy economic and social losses (International Training of Trainers on Wetland Management, 2009). Wetlands serve as protection to enable ecosystems survive and provide reliable benefit to community (Dungan, 1990).

Wetland inspection through the analysis of their status is not only necessary but essential for the implementation of sustainable use and management. Although, information on wetlands cover only exist at national levels, there if need to embark upon mapping of wetland at local government level since information on change and conversion is lacking except for a few cases. The interest therefore is in the monitoring of wetland areas and particularly wetland areas considered to be of vital importance (Winter, 1988).

The widespread depilation of wetlands in southwestern Nigeria with Ede in Osun State, a striking example may be attributed to heavy pressure due largely to agricultural activities, urban and infrastructural development, and solid waste disposal. The information on the current status of wetland resources in Ede is not well known and documented hence this paper investigated this using some geo-spatial techniques. To achieve this, digital maps which relate the feature to any given geographical location have strong usual impacts. Thus they are essential for monitoring and quantifying change over time scale, and assist in decision making. Remote sensing is now recognized as an essential tool for viewing, analyzing, characterizing and making decisions about land, water and atmospheric conditions (Orimoogunje, 2008).

During the past few decades, technological advances in the field of satellite remote sensing (RS) sensors, computerized mapping techniques, Global Positioning System (GPS) and Geographic Information System (GIS) have enhanced the ability to capture more detailed and timely information about the natural resources at various scales covering local, regional, natural and global levels of study. This study hence offered an exploratory survey of possible use of geo-spatial techniques in the monitoring of wetlands and their changes in Ede, Osun State, Nigeria.

Study Area

Ede is located between latitudes $7^0 36`$N and $7^0 46`$N of the equator and on longitudes $4^0 22`$E and $4^0 34`$E of the Greenwich meridian. Ede is a town in Osun State with a population of 304,738 persons following the 2006 census figures. The drainage system here ranges from open water bodies (dams, reservoirs and lakes) to rivers, streams, springs, wells, run-off waters and swamp/wetlands. Water basins such as Osun river and water dams are prominent and responsible for trapping and discharging water for efficient and rich drainage system of the area. The drainage system is responsible for influencing the microclimate of the area together with other factors as vegetation. Different land use patterns in the area include; farmlands, bushes, built up areas, swamps/wetlands and water bodies. The main agricultural products are sugarcane, plantain, cassava, cocoa, melon, kola nuts, maize and palm that are produced in large quantities.

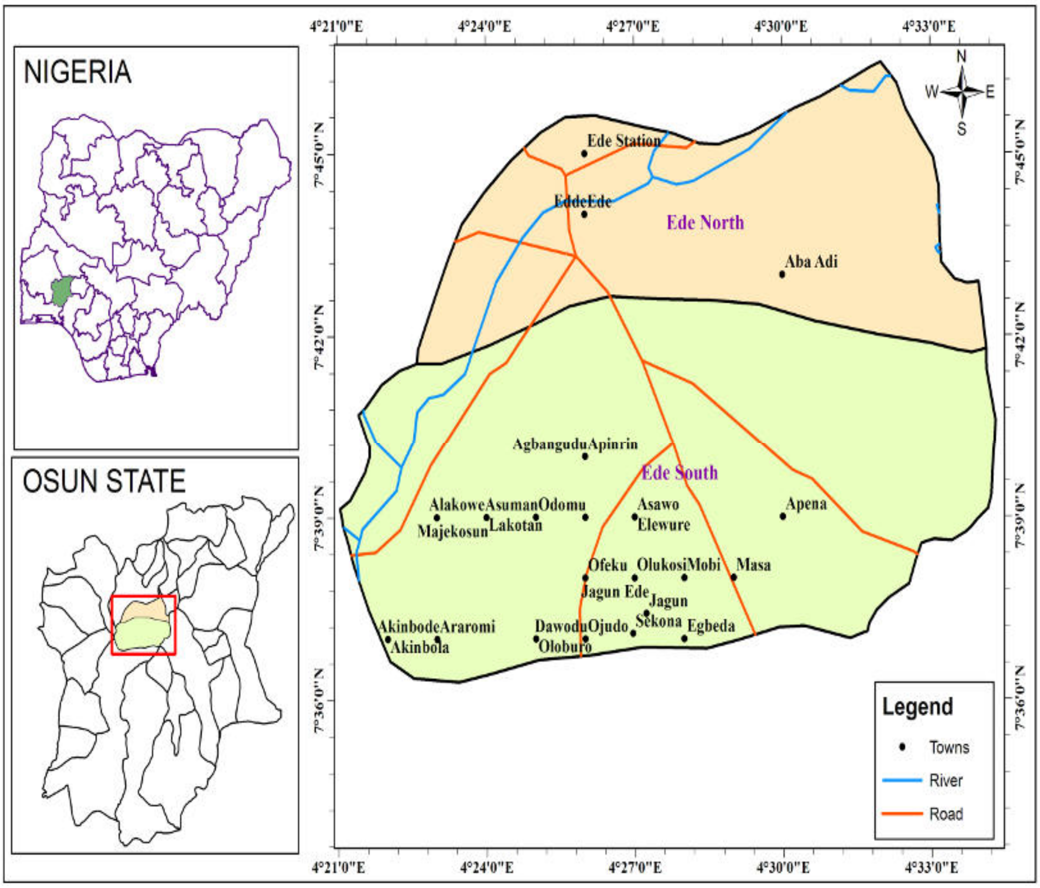

Fig.1 Study Area

Methodology

Spatial and non-spatial data sets were used for the study which included the administrative map of the study area extracted from the local government area at a scale of 1:50,000. Optical satellite images of Osun State were derived from landsat, TM and ETM+ sensor for 1986, 2002 and 2012. On image classification, supervised classification was done to match spectral classes in the data to the information of classes of interest in the ENVI 4.7 environment. The classes were defined as built up areas, bush land, farmland, bare land and wetlands/swamps. Further, the images were processed using ENVI 4.7 where operations as filtering were carried out to improve the image quality. This colour composite which assigned different bands of image to one of the three colour displays (RGB) helped for better visualization and interpretation. The false colour composites were used as contribution of near infrared, red and green bands. This band combination is good for vegetation study since vegetation has a high reflectance for chlorophyll at the near infrared band, thus giving different sheds of red for vegetation; making it useful for determining the extent of loss and health of the vegetation. The Area of Interest (AOI) was subset from the main images of the three years. This was to reduce the volume of data processed and to focus on the fit to scale of area of interest. The class masks are ENVI 4.7 classification images with class colours matching the final state image (2012) making it easy to identify not only where changes occurred but also the class into which the pixels changed. Check of the wetland status, pattern and size are affected by settlement, farmland, road network etc. The total area and shape length calculated also helped in assessing the size of wetlands covered on the ground in each level. Average wetland size for each level was then computed.

Results and Discussion

The field survey result identified nine (9) wetland sites with their general characteristics indicating current status and present land use types affecting them (table 1).

Table 1: Dominant characteristics of land use/land cover types of the area

s/no	Location	Land use class	Land use type
1	Osun river	Water body	Bridge
2	Awo	Wetlands	Plantain plantation
3	High court	Watertight	Sugarcane plantation
4	Water corporation	Water body	Grasses,farming&bananafarm
5	Ede dam	Water body	Dam
6	School of mission rd.	Built-up	Settlement
7	Redeemer's University	Built – up	Settlement
8	Ede junction	Vegetation	Grasses, farmland
9	Sekona	Vegetation	Plantain plantation

Land use activities such as settlements, infrastructure development and cultivation as shown in the above table have been going on in the wetlands. The larger area of the wetlands in Ede and its environs is used for settlement and agriculture, whereas in the urban areas, the larger portion of wetlands is used for infrastructural development as road construction, dams and educational institutes. Also fig. 2 further explains the location of these land use types.

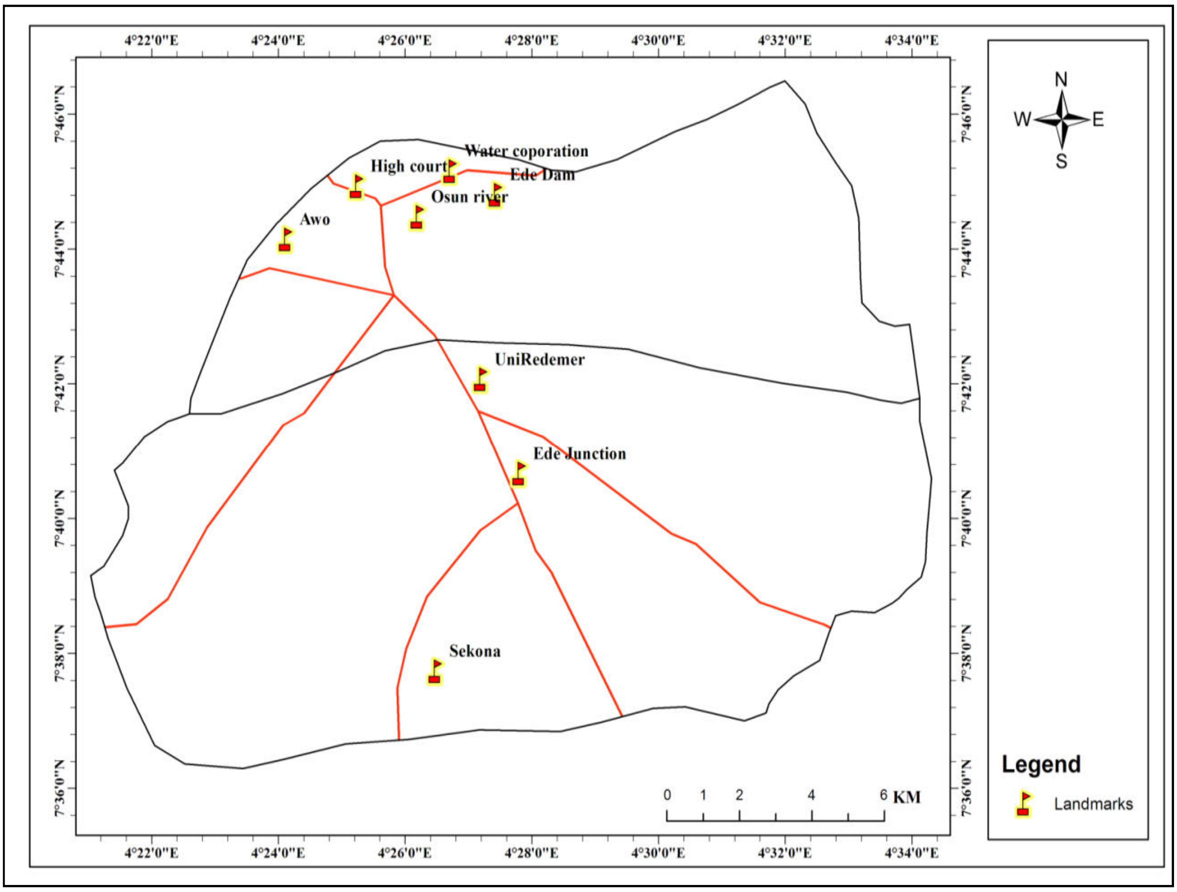

Fig. 2 Locations of land use types in the area

Table 2: Landsat images, land use/land cover classification results

	1984		2002		2012	
Classes	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%
Wetland	105.38	21.98	98.73	15.58	90.58	32.93
Built-up	14.35	2.99	45.56	6.16	79.28	16.47
Vegetation	232.4	50.57	226.83	46.49	215.57	31.43
Water body	12.7	0.58	5.79	4.73	3.25	3.69
Watertight	114.39	23.80	102.67	27.04	90.49	15.46
Total	479.22	100	479.58	100	479.17	100

The classification results on tables 2, figs. 3,4 and 5 for the different years; 1986, 2002 and 2012 show that built-up covered 14.35km^2 (2.99%) in 1986, 45.56km^2 (6.16%) in 2002 and increased to 79.28 km^2(16.47%) in 2012. Further, vegetation cover decreased gradually from 232.4 km^2(50.57%) in 1986 to 226.83 km^2 (46.49%) in 2002 and further decreased in 2012 to 215.57 km^2 (31.43%). The watertight area, due to massive cultivation and population increase had also increased from 114.39 km^2 (23.80%) in 1986 to 102.67 km^2(27.04%) in 2002 and to 90.49 km^2(15.46%) in 2012. Wetlands due to encroachment and farming activities had decreased from 105.38 km^2(21.98%) in 1986 to 98.37 km^2(15.55%) in 2002 and further decreased to 90.58 km^2(32.34%) in 2012. Water bodies also experienced a decrease from 1986 due to vegetation cover to 2002 and further decreased in 2012; it decreased from 12.7 km^2(0.58%) to 5.79 km^2 (4.73%) in 2012.

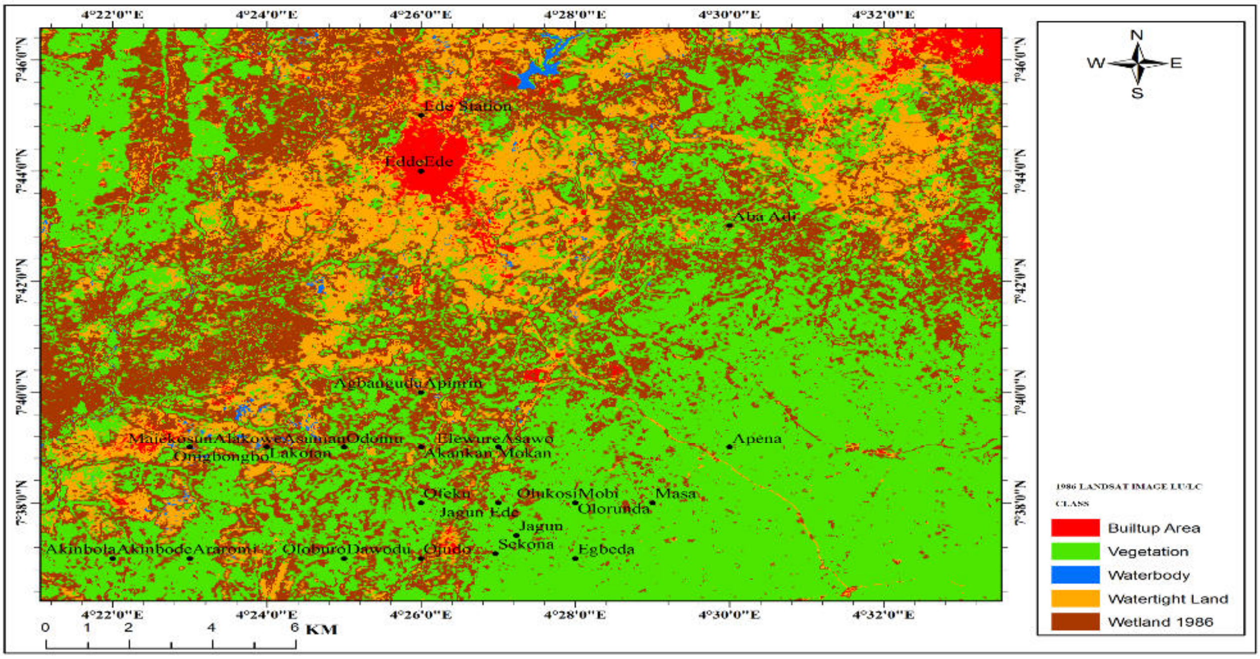

Fig. 3 1986 Image Classification of the study area

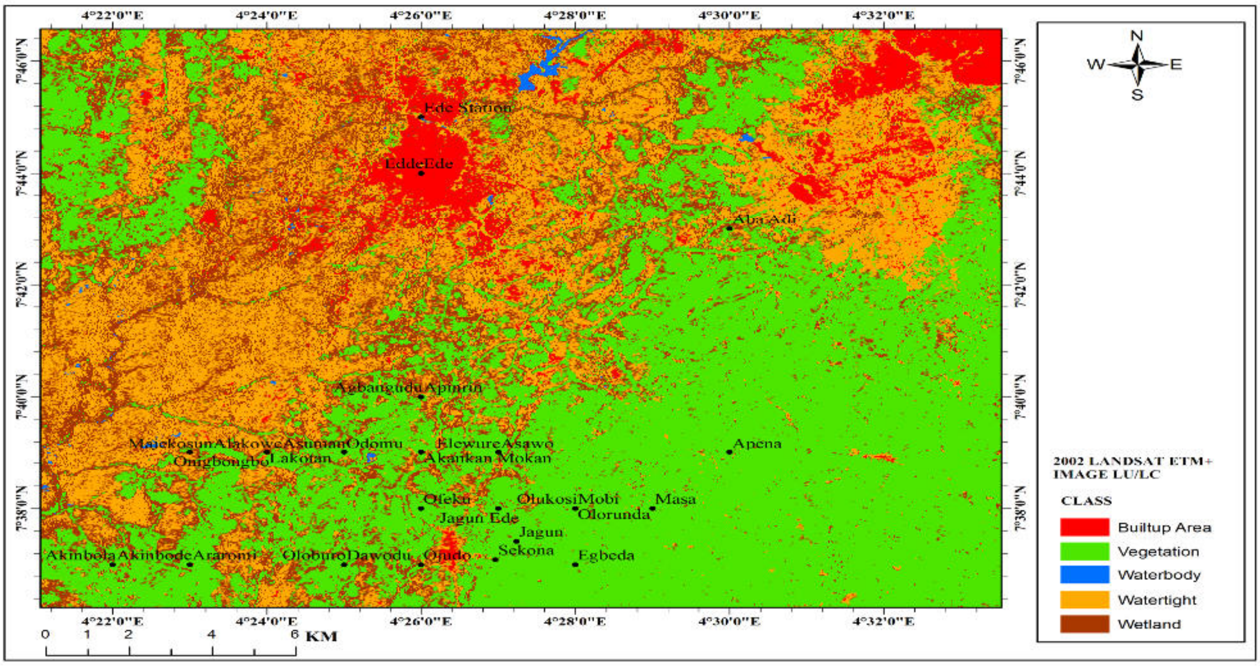

Fig.4 2002 Image Classification of the study area.

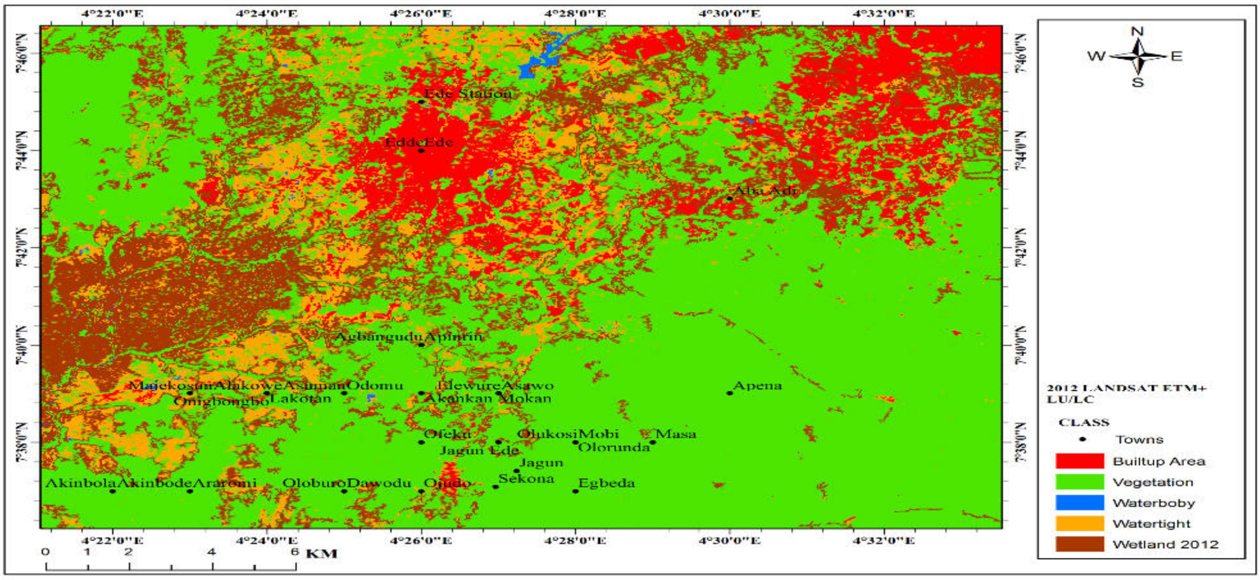

Fig.5 2012 Image Classification of the study area

Conclusions

Since wetlands play important roles in our socio-economic development, sustainable environmental management and protection, wetlands should be properly monitored. The study has observed human modification in terms of the reduction in the size of the original wetlands in the study area. This is as a result of the conversion of the wetlands into other land uses which support various findings of existing studies. It further discovered various social and economic activities and land uses going on around wetlands in the study area. These include residential quarters, farmlands and small scale industries. There is therefore need to protect this valuable ecosystem since unprotected wetlands will disappear faster than the protected one. Demarcating wetland zones in the cities can do this. The approach of geo-spatial technology and remote sensing data in this study was found useful and adequate for regular monitoring of earth resources.

References

Dungan, P. (1990). Wetland conservation: a review of current issues and required action.

Garnier, B.J. (1967). Weather conditions in Nigeria. Climatological research series, no. 2 Mc Gill University, Montreal Canada.

ITTWM (2009). International Training of Trainers on Wetland Management Wageningen, Netherlands.

Orimoogunje, O.O.I (2008). The impact of land use dynamics on Oluwa forest reserve in southwestern, Nigeria. Unpublished PhD Dissertation Department of Geography, Obafemi Awolowo University, Ile Ife.

Winter, T.C. (1988). A conceptual framework for assessing cumulative impacts on the hydrology
of non-tidal wetlands. Environmental management vol. 12

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar